

CLAIMS

1. A composition comprising or is produced by combining a titanium compound, a glycol, a phosphorus compound, and optionally water wherein said phosphorus compound is selected from the group consisting of a polyphosphoric acid or a salt thereof, a phosphonate ester, a pyrophosphoric acid or salt thereof, a pyrophosphorous acid or salt thereof, and combinations of two or more thereof.
2. A composition according to claim 1 wherein said titanium compound has the formula $Ti(OR)_4$, each R is independently selected from the group consisting of an alkyl radical, a cycloalkyl radical, an aralkyl radical, and combinations of two or more thereof, and each R contains from 1 to about 30 carbon atoms per radical.
3. A process according to claim 2 wherein said titanium compound is selected from the group consisting of tetra isopropyl titanate, tetra n-butyl titanate, and combinations thereof.
4. A process according to claim 1 wherein said glycol is selected from the group consisting of alkylene glycol, polyalkylene glycol, alkoxylated glycol, and combinations of two or more thereof.
5. A composition according to claim 4 wherein said glycol is selected from the group consisting of ethylene glycol, propylene glycol, isopropylene glycol, butylene glycol, 1-methyl propylene glycol, pentylene glycol, diethylene glycol, triethylene glycol, and combinations of two or more thereof.
6. A composition according to claim 3 wherein said glycol is ethylene glycol.
7. A composition according to claim 2 wherein said salt is selected from the group consisting of an alkali metal salt, an alkaline earth metal salt, and combinations thereof.
8. A composition according to claim 2 wherein said polyphosphoric acid has the formula of $H_{n+2}P_nO_{3n+1}$; said phosphonate ester is selected from the group consisting of $(R^1O)_2P(O)ZCO_2R^1$, di(polyoxyethylene) hydroxymethyl phosphonate, and combinations thereof; n is ≥ 2 ; each R^1 is independently selected from the group consisting of H, C_{1-4} alkyl, and combinations thereof; and Z is

selected from the group consisting of C₁₋₅ alkylene, C₁₋₅ alkylidene, and combinations thereof.

9. A composition according to claim 5 wherein said phosphorus compound is selected from the group consisting of potassium tripolyphosphate, sodium tripolyphosphate, potassium tetrapolyphosphate, sodium pentapolyphosphate, sodium hexapolyphosphate, ethyl phosphonate, propyl phosphonate, hydroxymethyl phosphonate, di(polyoxyethylene) hydroxymethyl phosphonate, methylphosphonoacetate, ethyl methylphosphonoacetate, methyl ethylphosphonoacetate, ethyl ethylphosphonoacetate, propyl dimethylphosphonoacetate, methyl diethylphosphonoacetate, triethyl phosphonoacetate, triethyl phosphonoacetate, and combinations of two or more thereof.

10. A composition according to claim 3 wherein said phosphorus compound is potassium tripolyphosphate.

11. A composition according to claim 6 wherein said phosphorus compound is potassium tripolyphosphate.

12. A composition comprising or is produced by combining tetraisopropyl titanate, ethylene glycol, potassium tripolyphosphate, and optionally water.

13. A composition comprising or is produced by combining a titanium compound, a glycol, water, and optionally a phosphorus compound wherein said titanium compound has the formula Ti(OR)₄, each R is independently selected from the group consisting of an alkyl radical, a cycloalkyl radical, aralkyl radical, and combinations of two or more thereof, and each R contains from 1 to about 30 carbon atoms per radical; said glycol is selected from the group consisting of alkylene glycol, polyalkylene glycol, alkoxyated alcohol, and combinations of two or more thereof; and said phosphorus compound is selected from the group consisting of a polyphosphoric acid or a salt thereof, a phosphonate ester, a pyrophosphoric acid or salt thereof, a pyrophosphorous acid or salt thereof, and combinations of two or more thereof.

14. A composition according to claim 13 wherein polyphosphoric acid has the formula of H_{n+2}P_nO_{3n+1}; said phosphonate ester is selected from the group

consisting of $(R^1O)_2P(O)ZCO_2R^1$, di(polyoxyethylene) hydroxymethyl phosphonate, and combinations thereof; n is ≥ 2 ; each R^1 is independently selected from the group consisting of H, C_{1-4} alkyl, and combinations thereof; and Z is selected from the group consisting of C_{1-5} alkylene, C_{1-5} alkylidene, and combinations thereof.

15. A composition according to claim 13 wherein said glycol is selected from the group consisting of ethylene glycol, propylene glycol, isopropylene glycol, butylene glycol, 1-methyl propylene glycol, pentylene glycol, diethylene glycol, triethylene glycol, and combinations of two or more thereof; and said phosphorus compound is selected from the group consisting of potassium tripolyphosphate, sodium tripolyphosphate, potassium tetrapolyphosphate, sodium pentapolyphosphate, sodium hexapolyphosphate, ethyl phosphonate, propyl phosphonate, hydroxymethyl phosphonate, di(polyoxyethylene) hydroxymethyl phosphonate, methylphosphonoacetate, ethyl methylphosphonoacetate, methyl ethylphosphonoacetate, ethyl ethylphosphonoacetate, propyl dimethylphosphonoacetate, methyl diethylphosphonoacetate, triethyl phosphonoacetate, di(polyoxyethylene) hydroxymethyl phosphonate, triethyl phosphonoacetate, and combinations of two or more thereof.

16. A composition according to claim 13 wherein said titanium compound is tetraisopropyl titanate; said glycol is ethylene glycol, and said phosphorus compound is potassium tripolyphosphate.

17. A composition according to claim 16 wherein said composition comprising or is produced by combining said tetraisopropyl titanate, said ethylene glycol, said potassium tripolyphosphate, and said water.

18. A process comprising contacting, in the presence of a catalyst composition, a carbonyl compound and an alcohol wherein said composition is as recited in any of claims 1 to 17.

19. A process according to claim 18 wherein said titanium compound has the formula $Ti(OR)_4$ and each R is independently selected from the group consisting of an alkyl radical, a cycloalkyl radical, aralkyl radical, and combinations of two or more thereof and contains from 1 to about 30 carbon atoms per radical.

20. A process according to claim 18 wherein said titanium compound is selected from the group consisting of tetra isopropyl titanate, tetra n-butyl titanate, and combinations thereof.

21. A process according to claim 19 wherein said carbonyl compound has the formula of R^2COOR^2 ; each R^2 is independently selected from the group consisting of (1) hydrogen, (2) hydrocarboxyl radical having a carboxylic acid group at the terminus, or (3) hydrocarbyl radical in which each radical has 1 to about 30, preferably about 3 to about 15 carbon atoms per radical which can be alkyl, alkenyl, aryl, alkaryl, aralkylradical, (4) a 5-sulfo isophthalate metal salt or its ester, and (5) combinations of two or more thereof.

22. A process according to claim 19 wherein said carbonyl compound is selected from the group consisting of terephthalic acid, dimethyl terephthalate, isophthalic acid, naphthalic acid, succinic acid, adipic acid, phthalic acid, glutaric acid, acrylic acid, oxalic acid, benzoic acid, maleic acid, propenoic acid, bis-glycolate ester of 5-sulfo isophthalate sodium salt, and combination of two or more thereof.

23. A process according to claim 20 wherein said carbonyl compound is terephthalic acid, dimethyl terephthalate, or combinations thereof.

24. A process according to claim 22 wherein said alcohol is selected from the group consisting of ethanol, propanol, isopropanol, butanol, ethylene glycol, propylene glycol, isopropylene glycol, butylene glycol, 1-methyl propylene glycol, pentylene glycol, diethylene glycol, triethylene glycol, 2-ethyl hexanol, and combinations of two or more thereof.

25. A process according to claim 23 wherein said alcohol is ethylene glycol.

26. A process according to claim 18 wherein said carbonyl compound is selected from the group consisting of terephthalic acid, dimethyl terephthalate, isophthalic acid, naphthalic acid, succinic acid, adipic acid, phthalic acid, glutaric acid, acrylic acid, oxalic acid, benzoic acid, maleic acid, propenoic acid, bis-glycolate ester of 5-sulfo isophthalate sodium salt, and combination of two or more thereof;

said titanium compound is selected from the group consisting of tetra isopropyl titanate, tetra n-butyl titanate, and combinations thereof; and

said alcohol is selected from the group consisting of ethylene glycol, propylene glycol, isopropylene glycol, butylene glycol, 1-methyl propylene glycol, pentylene glycol, and combinations of two or more thereof.

27. A process according to claim 26 wherein said carbonyl compound is terephthalic acid, dimethyl terephthalate, or combinations thereof and said alcohol is ethylene glycol.

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